Minimally Invasive Atlanto-Odontoid Joint Injection for Involvement in Rheumatoid Arthritis

A Case Report and Technical Note

V.J. KOSTANIAN, M.S. MATHEWS*, F.D. WESTHOUT*, N.N. BHATIA**

Department of Radiology, University of California-Irvine.
**Department of Neurosurgery, University of California-Irvine.*
***Department of Orthopedic Surgery, University of California-Irvine.*

Key words: atlanto-odontoid joint, theumatoid arthritis, steroid injections

Summary

This report shows that CT fluoroscopy guided anterior approach injections can be effectively utilized for inflammatory conditions affecting the atlanto-odontoid joint, and that steroid injections thus injected can provide pain relief lasting six months in properly selected patients. Patients with underlying rheumatoid arthritis demonstrating significant aggravation of neck pain with side to side (rotational) neck movements and refractory to medical therapy may be good candidates for the procedure.

Introduction

Rheumatoid Arthritis (RA) is a chronic systemic inflammatory disease that affects 1% of the population1. Involvement of the cervical vertebrae in rheumatoid arthritis occurs early in the course of the disease, and vertebral disease progresses in parallel with extremity disease2. Bony and soft tissue involvement of RA can create painful joint erosions and destruction. Lateral atlanto-axial joint injection of glucocorticoids has been used as a safe and efficacious therapy producing pain relief lasting over a year3. We report the case of an 82-year-old woman with longstanding RA affecting the cervical spine that was treated with an image guided intra-articular injection into the atlanto-odontoid joint through an antero-lateral approach.

Case Report

An 82-year-old woman presented to the outpatient clinic complaining of chronic debilitating neck pain. The pain occurred more on the right side of the neck and her right shoulder region, and was worse in the evenings. She had undergone physical therapy, and had received multiple injections for this pain including cervical epidural injections with no pain relief.

The patient also complained of not being able to hold her head upright, with the most comfortable position being moderate flexion with slight rotation. She complained of recent problems with walking secondary to imbalance and light headness, which were related to the position of her head. Physical examination revealed a significant kyphotic deformity of her cervical spine.

The patient took significant effort to bring her eyes to horizontal gaze, and could hold her neck up straight for only a few minutes before her neck muscles became tired and painful. In addition, she had marked pain and stiffness with rotation of her head suggesting that the atlanto-odontoid joint involvement was a significant cause of her pain.

Her posture was stooped forward with a scoliotic deformity of her thoracolumbar spine. She had an ataxic gait. Neurologically, she had grade 5/5 strength across all major muscle groups in all four extremities. Deep tendon re-

flexes were grade 3 in her biceps, triceps, brachioradialis, quadriceps and Achilles tendon. She had a mildly positive Hoffman sign on the left.

Technical Note

A decision was made to carry out minimally invasive injection of steroids and local anesthesia into her atlanto-odontoid joint using CT-fluoroscopy for image guidance. The patient was placed on a prone position on the CT table. Sequential axial images (3 mm x 2 mm) of the cervical spine were obtained from the skull base to the C3 vertebral body. Three dimensional reconstructed images were obtained and thoroughly evaluated.

The patient was then placed supine with maximum tolerated extension of her neck. CT scanning of her cervical spine was performed obtaining images from the skull base to the C4 vertebral body. Maximum caudal angulation of the CT gantry was used to obtain these images. After further study of obtained images a needle puncture site on the right mandibular area was marked on the skin. The right submandibular area was prepped and draped in a sterile fashion. A 22-gauge spinal needle with 45 degrees caudal angulation was aimed into the right parapharyngeal space, medial to the right ICA, and was directed superiorly to the anterior C1-C2 junction. CT fluoroscopy was utilized while the needle was being navigated to the target. Superficial and deep injections of Xylocaine were performed through the track of the needle. Finally, the tip of the 22-gauge needle was inserted into the synovial cavity of the atlanto-odontoid joint. 0.3 cc of contrast was injected into the joint.

The contrast demonstrated intra-articular injection with significant extravasation reflecting joint degeneration and rupture of the joint capsule. Following this maneuver a therapeutic mixture was made containing 80 mg of Depo-Medrol, 1 cc Marcaine, and 2 cc Xylocaine with epinephrine (all preservative free-MPF). One cc of this therapeutic mixture was injected intra-articularly into the median atlanto-odontoid joint following which the needle was withdrawn and 2.5-3 cc of the solution was injected peri-articularly.

The patient tolerated the procedure well. She noted a pressure sensation in the back of her neck with relief of her regular pain. The entire procedure was carried out under conscious sedation and local anesthesia.

The patient's vital signs were monitored via electrophysiological monitoring and remained stable throughout the interventional procedure. Post-procedure she was observed for four hours with complete relief of her neck pain. The patient was seen for follow up at two weeks, three months, and six months post-procedure.

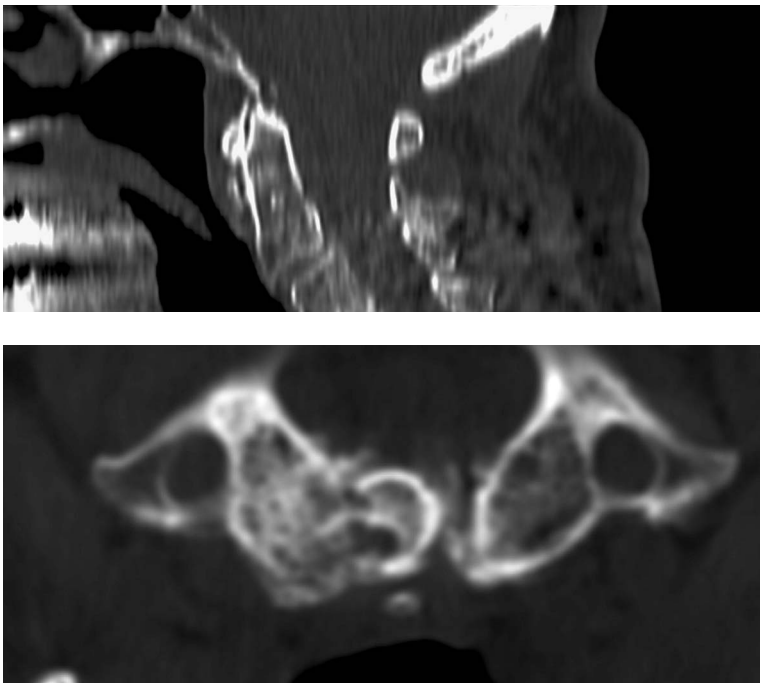

Figure 1 Sagittal reconstruction images of C1-C2 vertebrae showing lytic destructive changes in the atlanto-odontoid joint with severe narrowing of the joint space, apposition of the odontoid process against the clivus with pressure erosions and destruction of the odontoid tip (A). Axial CT scan of the atlanto-odontoid joint shows decreased joint space and small cystic changes on both sides of the joint (B).

Imaging Findings

MRI of the cervical spine was contraindicated in this patient secondary to a permanently implanted bladder pacemaker. Imaging findings of CT cervical spine of the patient is shown in figures 1.

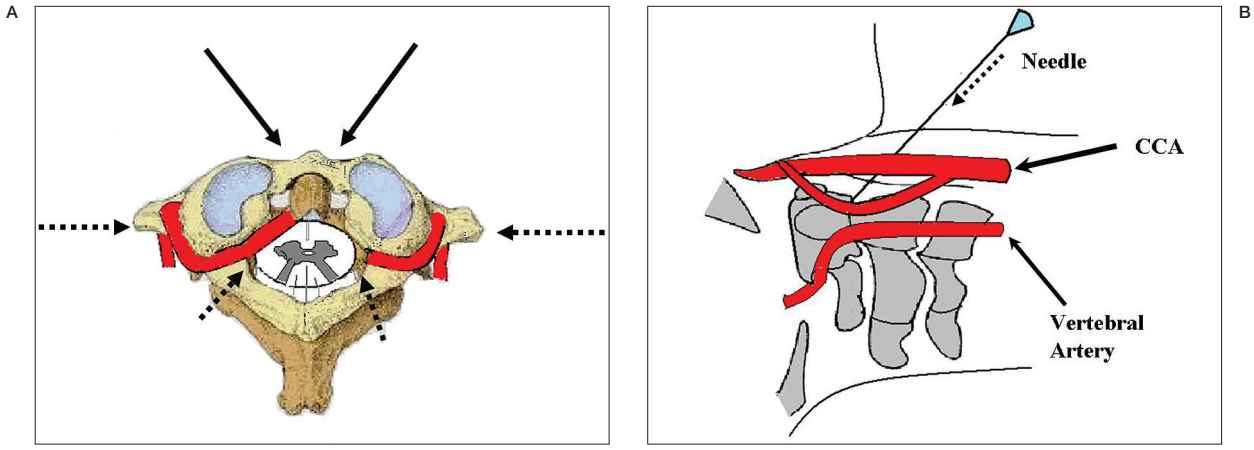

Figure 2 Figure showing position of the vertebral arteries (in red) the relative to that of the first and second cervical vertebrae. Several routes of access were considered to the atlanto-odontoid joint including lateral and posterolateral approaches (broken arrows, A). The position of vertebral arteries and narrow epidural space precluded safe needle placement laterally or postero-laterally. This injection was performed through an antero-lateral approach (solid arrows in A) through the parapharyngeal space. B) Needle placement into the atlanto-odontoid joint through an anterior approach showing the relations of the vertebral artery, the common carotid artery (CCA), internal carotid artery and the carotid artery to the C1 and C2 vertebrae.

Results

During the routine four hour post-procedure observation period the patient was completely relieved of her neck pain. Two week follow-up in the clinic revealed continued efficacy of the injection. At three and six month follow-up the patient revealed an 80% decrease in her regular neck pain, and significant decrease in her daily intake of pain medication.

In the described technique we used an anterior approach for injecting the median atlanto-odontoid joint. While this technique can be effectively performed using fluoroscopic CT guidance, it is not without dangers.

Risks from the procedure include puncture of the ipsilateral carotid arteries and bacterial contamination from perforation through the oropharyngeal mucosa, which then can establish an infective arthritis of the atlanto-odon-

Discussion

Image guided steroid injections of the spine are routinely performed, and their efficacy is established [4,5]. Cervical vertebral, atlanto-occipital, and lateral atlanto-axial joint dysfunctions are known to cause identifiable patterns of radiating pain [6].

The aggravation of neck pain in the reported patient with side-to-side neck movements suggests primary involvement of the atlanto-odontoid joint, which was confirmed on pain relief with intra-articular injection of steroids and local anesthetic.

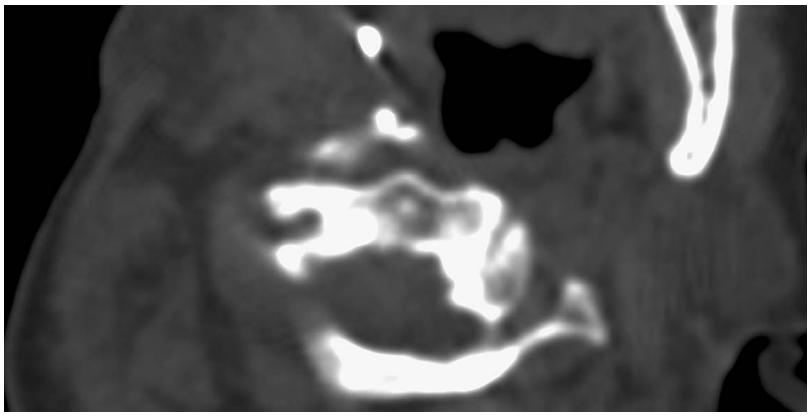

Figure 3 Shows a needle in the parapharyngeal space directed towards the target atlanto-odontoid joint. The CT image does not show the full length of the needle secondary to restricted angulation of the CT gantry (maximum 15 degree). The needle is represented by a hyperdense point anterolateral to the atlanto-odontoid joint approaching from the right side. On withdrawal of the needle contrast is seen to leak out of the atlanto-odontoid joint space secondary to a ruptured joint capsule.

toid joint with ensuing complications of osteomyelitis or epidural abscess. We strongly recommend using fluoroscopic CT for image guidance to adequately visualize the anatomical relationships in the parapharyngeal space. It is important to remember that while joint injections provide palliative relief of joint pain in properly selected patients, they do not alter progression of the disease process.

Since this injection provides at least short-term pain relief, it could also serve as an excellent tool in predicting good outcome for cases where surgery is indicated.

Conclusions

This report shows that CT fluoroscopy guided anterior approach injections can be effectively utilized for inflammatory conditions affecting the atlanto-odontoid joint, and that steroid injections thus injected can provide pain relief lasting six months in properly selected patients. Patients with underlying rheumatoid arthritis demonstrating significant aggravation of neck pain with side to side (rotational) neck movements and refractory to medical therapy may be good candidates for the procedure.

References

1 Wolfs JF, Peul WC et Al: Rationale and design of The Delphi Trial - I (RCT)2: International randomized clinical trial of rheumatoid craniocervical treatment, an intervention-prognostic trial comparing "early" surgery with conservative treatment. BMC Musculoskelet Disord (16): 7-14, 2006.
2 Grob D, Schutz U, Plotz G: Occipitocervical fusion in patients with rheumatoid arthritis. Clin Orthop Relat Res 366: 46-53, 1999.
3 Glemarec J, Guillot P et Al: Intraarticular glucocorticosteroid injection into the lateral atlantoaxial joint under fluoroscopic control. A retrospective comparative study in patients with mechanical and inflammatory disorders. Joint Bone Spine 67(1): 54-61, 2000.
4 Chevrot A, Chevrot AL et Al: Image-Guided Spinal Steroid Injections. Semin Musculoskelet Radiol 1(2): 221-230, 1997.
5 Chevrot A, Cermakova E et Al: C1-2 arthrography. Skeletal Radiol 24(6): 425-429, 1995.
6 Dreyfuss P, Michaelsen M, Fletcher D: Atlanto-occipital and lateral atlanto-axial joint pain patterns. Spine 15; 19(10): 1125-1131, 1994.

Marlon S. Mathews, MD
101 The City Drive South,
Bldg 56, Rm 400,
Orange, CA 92868.
U.S.A.
E-mail: mmathews@uci.edu